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Interactive comment on "Microwave Radar/radiometer for Arctic Clouds MiRAC: First insights from the ACLOUD campaign" *by* Mario Mech et al.

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We thank the reviewer for his time to carefully read the manuscript. However, we would like to clarify a few points.

It is important to state upfront that the integration of a 94-GHz FMCW radar on the Polar 5 is not the result of careful design for the aircraft selection (otherwise a higher altitude platform could have been selected) or the radar selection (where a single antenna, pulsed 94-GHz radar makes more sense). The research team was provided with one platform option and one available system that was designed for ground-based observations. Fortunately, the Polar 5 aircraft is large enough to accommodate a bistatic

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radar system and we agree with the reviewer that a bistatic radar system is not generally preferred for aircraft deployment. The reviewer is certainly familiar with FMCW signal processing and appreciates the foresight of the research team to point the radar off-nadir by 25 degrees. As the reviewer points out, the surface echo side lobes are considerably reduced with this configuration.

Regarding the selection of an FMCW system, we would like to add that this particular radar system is not the first FMCW 94-GHz radar system. The Naval Postgraduate School (NPS) and Prosensing were operating a 94-GHz radar system on a twin otter for over a decade. One of the co-authors (Kollias) was involved in the analysis of the observations from this system and we agree that the surface echo affects significantly our ability to see weak targets. Solid state, high duty cycle transmitters are the future as it was clearly demonstrated with the launched of RainCube by JPL a smallsat that uses a pulse length of 160 microseconds and chirp to provide superior range resolution and excellent characterization of the transmitted waveform for optimum suppression of the surface return. In our case, we could not rely on such performance of the pulse compression and we employed post-processing that is explained in the manuscript.

One last reason why we do not describe the actual system in more detail is because the system is an exact copy of the ground-based version described in Kuechler et al. 2017.

Regarding the scientific content we like to note, that the manuscript is intended for the special issue of the ACLOUD campaign and provides important background for all using these data. Providing some simple macrophysical statistics is thus helpful in putting the measurements into context. Note that the prefered flight altitude of 10000ft in the unpressurized aircraft is due to limitation imposed by the lidar onboard, which is only certified up to this altitude. The issue of liquid water attenuation is important for the planned retrieval development which will also incorporate passive microwave and lidar measurements. Studies addressing this issue will be cited in a revision, e.g., Kuechler et al. 2018 or Meywerk et al. 2005.

On a moving plattform, the unfolding of the Doppler velocity is rather difficult. What would help is a sufficiently good background wind information, that could be used together with the aircraft speed. But unfortunately, no continuous wind profile measurements were available on board Polar 5, and the rather small number of dropsondes doesn't help with that. Using model data has been found to be to inaccurate. Any attempts that have been made so far were not very satifying. The only cases were we could derive somehow the Doppler velocity is for clouds that have been probed by the aircraft from different directions in rather short time periods.

We agree that over complex terrain the problem of filtering and removing the range lobes is more difficult. Especially the blind zone will be more investigated in future studies. Since we focus only on flights over open ocean, the marginal sea ice zone, and sea ice (all three areas shown in the case study Fig.7), this is not an issue for the measurements taken during the ACLOUD campaign, the recently performed ones during AFLUX, and the upcoming MOSAiC flights. So far, no case has been found in all flights where strong weather echos influenced our method of removing range lobes. We thank the author to point us to this issue and will take special care on this in future campaigns where we might experience stronger weather echos.

These arguments will be made more clear in a revised version of the paper.

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